Center Innovation Fund: JSC CIF

Onboard Adaptive Safe Site Identification System (OASSIS)

Completed Technology Project (2017 - 2019)

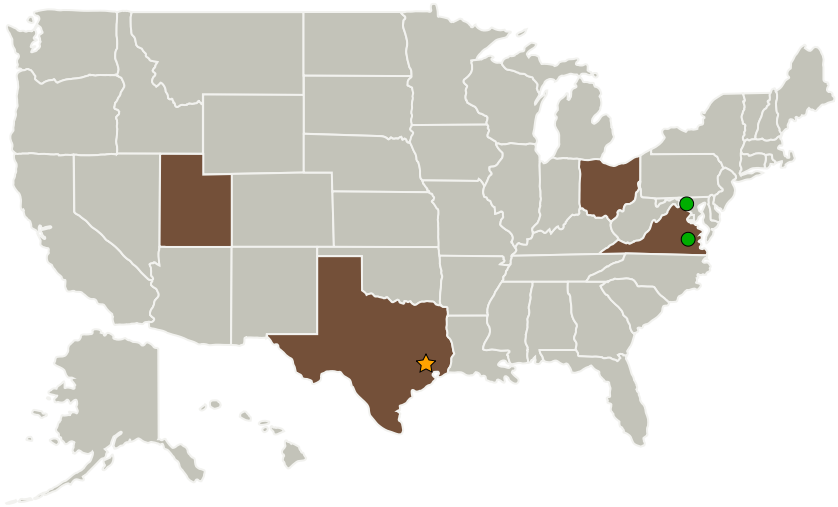
Project Introduction

The research plan includes combining terrain relative navigation with an optical camera with local map (hazard relative navigation) wih a LiDAR. We will investigate how to integrate both optical nav schemes whether it is the transition from one to the other or combining them. The funds for increasing lab fidelity will be spend on an automotive car LiDAR fr better local terrain mapping indoors (and outdoors), and a high fidelity mock terrain surface to test algorithms. The results of this project will help SPLICE, which is NASA's precision landing technology development project for the next 2 years at least.

Anticipated Benefits

Future lander missions need the ability to land precisely and safely. OASSIS year 1 developed the capability to test terrain relative navigation algorithms using low cost low fidelity sensors to help integrate autonomous precision landing systems more thoroughly prior to flight tests. Year 2 will build upon this effort by continuing algorithm development and increasing the fidelity of the sensors in the lab. The goal of OASSIS was to develop an indoor/outdoor portable platform with relevant sensors and GN&C algorithms to advance the development of precision landing technologies without the limitations of a pure simulation environment or prohibitive flight test costs. The resulting setup will give us the ability to experiment, while putting sensors in motion, with new precision landing algorithms for future robotic and human landers that require terrain relative navigation and hazard detection onboard.

Primary U.S. Work Locations and Key Partners



Onboard Adaptive Safe Site Identification System

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Organizations Performing Work	Role	Type	Location
Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
Texas A & M University-College Station(Texas A&M)	Supporting Organization	Academia	College Station, Texas

Co-Funding Partners	Type	Location
Langley Research Center(LaRC)	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
Ohio	Texas
Utah	Virginia

Project Transitions

October 2017: Project Start

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

Project Management

Program Director:

Michael R Lapointe

Program Manager:

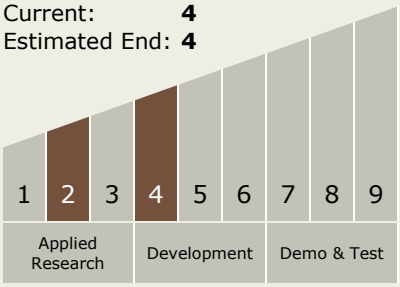
Carlos H Westhelle

Principal Investigators:

Ronney S Lovelace
Carolina I Restrepo
Cinnamon A Wright

Technology Maturity (TRL)

Start: **2**
Current: **4**
Estimated End: **4**



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September 2019: Closed out

Closeout Summary: Current landing sensors and algorithms allow us to land within a few kilometers from the target site. Human lander missions, or future robotic landers, will need to land within 100’s to 10’s of meters from the target site. Recent NASA projects such as SPLICE (Safe and Precise Landing Integrated Capabilities Evolution), have been advancing precision landing technologies through the development of space hardware and flight testing. The goal of the OASSIS project is to bridge the gap between pure simulation and costly flight tests by providing a physical platform to experiment with new research algorithms while using representative sensors in motion. Currently, OASSIS is developing a small lab-scale platform with guidance, navigation, and control (GN&C) sensors and software with the goal of researching and maturing precision landing functions. The platform, named Navigation, Estimation, and Sensing Testbed (NEST), enables lunar lander flight software to be tested dynamically without the need of a costly flight campaign and without the risk of catastrophic hardware loss. NEST has enough sensors and software to perform terrain relative navigation functions by identifying and tracking surface features to help reduce navigation errors and avoid terrain hazards that could potentially damage a lander.

Project Website:

https://www.nasa.gov/directorates/spacetech/innovation_fund/index.html#.VC

Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
  - TX09.4 Vehicle Systems
    - TX09.4.7 Guidance, Navigation and Control (GN&C) for EDL

Target Destinations

The Moon, Mars